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EXAMINER	
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Please find below and/or attached an Office communication concerning this application or proceeding.

LN

Office Action Summary	Application No. 09/372,636	Applicant(s) HORNSCHEMEYER ET AL.
	Examiner Kevin P. Kerns	Art Unit 1725

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *06 May 2003* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-7,9-12,14 and 15* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-7,9-12,14 and 15* is/are rejected.

7)☒ Claim(s) *1* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *11 August 1999* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 24 .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

Continued Prosecution Application

1. The request filed on May 6, 2003 for a Continued Prosecution Application (CPA) under 37 CFR 1.53(d) based on parent Application No. 09/372,636 is acceptable and a CPA has been established. An action on the CPA follows.

Drawings

2. The drawings are objected to under 37 CFR 1.83(a) because they fail to show the "meniscus" as described in the specification. Any structural detail that is essential for a proper understanding of the disclosed invention should be shown in the drawing. MPEP § 608.02(d). A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Objections

3. Claim 1 is objected to because of the following informalities: in claim 1, 1st line, "a" should be deleted after "for". In claim 1, 6th line, a hyphen should be added between the 2nd instance of "cooling surface" for consistency with the 1st instance of this term. In claim 1, 2nd line from the bottom, a comma should be added after "die", and "an" should be added before "increased". Appropriate correction is required.

Claim R jections - 35 USC § 112

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 1-7, 9-12, 14, and 15 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claims 1, 3, 6, and 7, it is not clearly set forth what material forms a "meniscus" (molten metal or coolant liquid?). It is believed that "molten metal" should be added before "meniscus" to clearly define the "meniscus".

In claim 1, 5th and 6th lines, it is not clearly set forth what material is poured into a "pouring side" (molten metal or coolant liquid?). It is believed that "molten metal" should be added before "pouring side" to clearly define the "pouring side".

In claims 1, 6, 7, and 9-11, it is not clearly set forth what material comprises a "bath" (molten metal or coolant liquid?). It is believed that "coolant liquid" (or an equivalent, e.g. water) should be added before "bath" to clearly define the "bath".

The term "thermally and mechanically stressed areas" (in claims 1, 10, and 12), and "the critically stressed areas" (in claim 1) are relative terms which render the claims indefinite. The terms "thermally and mechanically stressed areas" and "the critically stressed areas" are not defined by the claims, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. What degree of "thermal and mechanical stress" in what "areas" would be acceptable to one of ordinary skill in the

art, such that the skilled artisan would view such stress as "critical"? In comparison, what "areas" of the apparatus could possibly have "minimal" or "no" stress? In the continuous casting art, several parameters produce thermal and mechanical stress, such that the entire apparatus (everywhere) would be under such stresses to a certain degree (and covering a wide range of quantitative values). For example, high temperature stress caused by molten metal within the continuous casting mold (whether in the presence or absence of any cooling), temperature differential stress in different regions of the mold, the stress on the mold and/or coolant plates and associated bolts that attach the coolant plates due to the weight of the plates and/or varying amounts of (high temperature and weight) molten metal in the mold, are all significant stresses to be considered in the design of continuous casting machines.

In claim 1, "the remainder of the surface of the casting die" is an indefinite structural feature that does not distinctly set forth the claim, as "the remainder of the surface of the casting die" cannot be treated as an entire equivalent region outside the "cooling zone having a rate of heat flow 5-40% greater". In other words, the properties of a "remainder of the surface" that is only a distance of 5 cm from the "cooling zone" are not equivalent to an area 50 cm from the "cooling zone" in terms of temperature, heat flow, and thermal/mechanical stresses etc. Regions within the "cooling zone" would have widely differing rates of heat flow than the so-called "remainder of the surface" regions that are, for example, 5, 20, 50, 100 cm above and below the "cooling zone", "meniscus", and/or other areas in the casting die.

In claim 1, the “meniscus” itself has not been positively and distinctly claimed as being in any particular region of the casting die, rendering the claim indefinite.

Claim 1 recites the limitation "the mold surface". There is insufficient antecedent basis for this limitation in the claim.

Claims 5 and 12 recite the limitations "the first end" and "the second end". There is insufficient antecedent basis for these limitations in the claims.

In claims 6 and 7 (4th line of both claims), the “length of the meniscus” is an unclear term, as the “meniscus” (if molten metal meniscus, as applicants probably intended) is arranged horizontally across the casting die. The term “length” should be changed to “width” if the “meniscus” limitation is maintained by the applicants. Since a “meniscus” of a liquid material is often not a straight line, but rather a curve (e.g. water, mercury etc.), the claims would be more clearly written if the cooling zone was defined in terms of the broad-side wall adjacent to the meniscus rather than the meniscus itself.

In claim 9, “the other areas of the bath surface” are indefinite features that do not distinctly set forth the claim, as “the other areas of the bath surface” cannot be treated as entirely equivalent regions outside the “cooling zone” of “10-20% greater”. In other words, the properties of “other areas of the bath surface” that are only a distance of 5 cm from the “cooling zone” are not equivalent to “other areas” that are 50 cm from the “cooling zone” in terms of temperature, heat flow, and thermal/mechanical stresses etc. Regions within the “cooling zone” would have widely differing rates of heat flow than the so-called “other” regions that are, for example, 5, 20, 50, 100 cm above and below the “cooling zone” of the casting die.

In claims 10 and 11, it is unclear whether or not the "wall thickness" in "other areas" of claim 11 are of a constant value, as claim 10 recites that the "wall thickness" is "reduced". In claim 10, does the term "reduced" mean "smaller, but of constant value" or "tapering"? Claims 10 and/or claim 11 should be written to clearly define the term "reduced", such that the value "1 to 6 mm" is compared to a distinctly defined structure.

In claims 12, 14, and 15, it is unclear what the difference(s) is/are between a "coolant channel" and "coolant bore holes", as a "channel" is comprised of a "hole", and a "bore hole" is considered to be a "channel". What are the structural differences between these features with regard to dimensions, geometries etc., such that these features would not be considered to be equivalents, as the applicants (probably) do not intend them to be?

Claim 14 recites the limitation "the coolant channels". There is insufficient antecedent basis for this limitation in the claim. If the applicants continue to use this limitation in claim 12, they are suggested to change the claim 12 limitation to delete "at least one" to set forth the plural "channels".

The terms "transitional area" and "gradually narrower" in claim 14 are unclear terms which render the claim indefinite. It is unclear what region of the liquid-cooled casting die defines this so-called "transitional area". Although "gradually narrower" is deemed to mean "tapering in a conical manner", it remains unclear with respect to what direction (as a part of what larger structural feature?) the channels/bore holes become "gradually narrower"?

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

8. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

9. Claims 1-7, 9-12, 14, and 15 insofar as definite are rejected under 35 U.S.C. 103(a) as being unpatentable over Grove et al. (US 5,927,378).

Grove et al. disclose a continuous casting mold assembly (funnel-shaped with billet-entrance side wider than billet-exit side) in which molten metal is shaped (formed) and cooled within the casting space, further containing a selective cooling structure to accommodate heat transfer inequality due to circulation patterns, which lead to mold deterioration, particularly in the meniscus region 28 of the mold assembly (abstract; column 1, lines 60-63; column 2, lines 4-30; column 3, lines 12-61; and Figures 2 and 3). The liner plates are conventionally made of copper (column 1, lines 12-15). The mold assembly has a plurality of cooling slots (grooves), in which the area around the meniscus (a thermally stressed area) contain slots machined to be deeper to produce an enhanced cooling effect at the area proximate to the meniscus 28, while producing a diminished cooling effect to other portions of the assembly (column 3, lines 28-67; column 4, lines 1-19; and Figures 2 and 3). The slot width (e.g. the gradually narrower slots 6 and 7 of Figure 2, with respect to slot 5 nearer the molten metal pouring side), length, spacings relative to transition region III (stressed area), and/or depths of the slots (see slots 1-19 in Figure 2), as well as the residual thickness parameters are varied accordingly along the funnel mold wall (column 4, lines 20-53; and Figures 2 and 3). The variable wall thickness in the meniscus region 28 (thermally stressed area of the broad-side wall of the mold liner assembly) is reduced on the order of a few millimeters (column 2, lines 4-30; column 4, lines 20-53; and Figures 2 and 3). Although Grove et al. do not teach a rate of heat flow in the more stressed area (e.g. meniscus region 28) that is specifically within the range of 5-40% greater than in the "remainder" of the surface of the casting die or 10-20% greater than in the "other remaining areas" of

the bath surface (in which an arbitrary point selected from a set of points within such indefinite "remainder" and "other remaining areas", respectively, would not have equivalent thermal properties), one of ordinary skill in the art would have recognized that various regions of the Grove et al. mold assembly set forth a wide range of heat flow rate values, specifically in the cooling zone in and around the thermally stressed area near the meniscus 28, the structure of which contains slots machined at enhanced dimensions in order to produce enhanced and desired cooling in areas of the mold most susceptible to wear, namely the meniscus region suggested by Grove et al. (Grove et al.; column 3, lines 12-15 and 37-61).

10. Claims 1 and 9 insofar as definite are rejected under 35 U.S.C. 103(a) as being unpatentable over Villanueva et al. (US 5,797,444).

Villanueva et al. disclose an ingot mold (form-giving die of high heat conductivity) for continuous casting of metals in which its cooling-side surface has depressions, or cooling-optimized areas to constitute a region having elevated heat transfer coefficients (abstract; column 2, lines 3-8 and 20-28; and Figures 1 and 2). These regions of enhanced heat transfer, i.e. rate of heat flow, are generally located over the area(s) of the mold where optimized heat dissipation is desired, or relative to the other areas of the mold (column 1, lines 14-16 and 24-26; and column 2, lines 3-5, 20-24, 35-37, and 44-46). The cross-sectional area at the casting pour-in side is larger than that of the billet exit side (abstract; column 1, lines 5-10; and Figures 3, 4, and 8). Although Villanueva et al. do not teach a rate of heat flow in the more stressed area (where

optimized heat dissipation is desired) that is specifically within the range of 5-40% greater than in the "remainder" of the casting die or 10-20% greater than in the "other remaining areas" of the bath surface (in which an arbitrary point selected from a set of points within such indefinite "remainder" and "other remaining areas", respectively, would not have equivalent thermal properties), one of ordinary skill in the art would have recognized that various regions of the Villanueva et al. ingot mold set forth a wide range of heat flow rate values, specifically in the abovementioned area(s) of the mold where optimized heat dissipation is desired, or the areas susceptible to the most mechanical and thermal wear, where optimized and/or preferential cooling is provided (Villanueva et al.; column 2, lines 44-46).

11. Claims 1-5 and 9 insofar as definite are rejected under 35 U.S.C. 103(a) as being unpatentable over Stagge et al. (WO97/43063). <u>Note: for the Stagge et al. reference, page numbers and lines herein refer to the English translation of this German reference (provided in the prior office action of June 6, 2001). See the prior office action for the corresponding German pages/lines, if necessary.</u>

Stagge et al. teach a funnel-shaped liquid-cooled chill mold (casting die) with a form-giving casting die body (page 6, lines 2-8; and Figure 1), which is made of a material of high-heat conductivity, namely copper (page 3, lines 3-12; page 6, lines 17-19; and Figure 3). The cooling-surface side of the chill mold, comprised of a cooling zone with multiple cooling channels for greater heat flow dissipation, is oriented on the sides of the mold with the thermally and mechanically stressed areas of the mold (page

4, lines 2-26; page 5, lines 1-5; page 6, lines 24-26; and Figures 2-4). The liquid-cooled chill mold (casting die) includes a cavity that is composed of two broad-side walls and narrow-side walls delimiting the width of the slab, or billet (page 6, lines 2-16). Deeper grooves are provided around the metal bolts for optimized cooling in these areas (Figures 3 and 4). The cross-section of the mold at the pouring-in-side end is greater than at the billet-exit-side end, or of a descending funnel shape with a hollow cavity becoming smaller in the pouring direction (page 4, lines 6-8; and Figure 1). Although Stagge et al. do not teach a rate of heat flow in the more stressed area (e.g. around metal bolts and the bath level – page 3, lines 14-24) that is specifically within the range of 5-40% greater than in the “remainder” of the casting die or 10-20% greater than in the “other remaining areas” of the bath surface (in which an arbitrary point selected from a set of points within such indefinite “remainder” and “other remaining areas”, respectively, would not have equivalent thermal properties), one of ordinary skill in the art would have recognized that various regions of the liquid-cooled chill mold of Stagge et al. set forth a wide range of heat flow values, specifically in the abovementioned mechanically stressed areas of the mold, such as around the regions occupied by the metal bolts and bath level, such that the optimized and/or preferential cooling around these areas would reduce such stresses (Stagge et al.; page 3, lines 14-24; and Figures 3 and 4).

12. Claims 1 and 9 insofar as definite are rejected under 35 U.S.C. 103(a) as being unpatentable over Euler et al. (US 4,658,884).

Euler et al. disclose a mold for continuous casting of billets, in which the mold is cooled by water forced through grooves provided in the area of the liquid bath level (molten metal meniscus) of the mold with sides in contact with cooling water and molten metal, respectively (abstract; column 4, lines 3-21; and Figures 1-3). Such cooling is advantageous for reducing mold damage, most likely to occur in the most stressed areas (abstract; column 1, lines 51-54; and column 2, lines 22-25). Although Euler et al. do not teach a rate of heat flow in the more stressed area (liquid bath level/molten metal meniscus) that is specifically within the range of 5-40% greater than in the "remainder" of the casting die or 10-20% greater than in the "other remaining areas" of the bath surface (in which an arbitrary point selected from a set of points within such indefinite "remainder" and "other remaining areas", respectively, would not have equivalent thermal properties), one of ordinary skill in the art would have recognized that various regions of the continuous casting mold of Euler et al. set forth a wide range of heat flow values, specifically in the molten metal meniscus region (thermally and mechanically stressed areas of the mold), such that mold damage, which is most likely to occur in the most stressed areas of the mold, is reduced upon use of optimized and/or preferential cooling (Euler et al.; abstract; column 1, lines 51-54; and column 2, lines 22-25).

13. Claims 1 and 9 insofar as definite are rejected under 35 U.S.C. 103(a) as being unpatentable over Mallener (US 3,595,302).

Mallener discloses a cooling structure for a continuous casting mold in which cooling mold plates with coolant grooves form a casting mold (die), such that the

grooves in the middle and upper portions are closer together and deeper to permit greater heat abstraction through the middle and upper portions, which are thermally and mechanically stressed areas (abstract; column 2, lines 7-11 and 49-75; column 3, lines 1-75; column 4, lines 1-49; and Figures 1-7). A uniform temperature gradient is obtained by the preferential cooling (differential heat flow) of the upper portion of the mold (column 1, lines 34-39; and column 3, lines 36-44 and 56-62). Although Mallener does not teach a rate of heat flow in the more stressed area of the bath surface that is specifically within the range of 5-40% greater than in the "remainder" of the casting die or 10-20% greater than in the "other remaining areas" of the bath surface (in which an arbitrary point selected from a set of points within such indefinite "remainder" and "other remaining areas", respectively, would not have equivalent thermal properties), one of ordinary skill in the art would have recognized that various regions of the cooling structure for a continuous casting mold of Mallener set forth a wide range of heat flow rate values, specifically in the upper portion of the mold, which is a highly stressed area, and optimized and/or preferential cooling would be provided in order to abstract heat and obtain a uniform temperature gradient by preferential cooling (Mallener; column 1, lines 34-39).

14. Claims 1, 2, and 9 insofar as definite are rejected under 35 U.S.C. 103(a) as being unpatentable over Makelainen et al. (GB 2 177 331).

Makelainen et al. disclose a continuous casting (copper) mold for billet casting, in which the mold has a plurality of grooves, such that thermal strain in the mold at the

boundary of the molten metal (meniscus) is reduced in those regions by changing the heat transfer capacity of the mold (abstract; page 1, lines 22-26, 44-51, and 88-105; and Figures 1-3). Although Makelainen et al. do not teach a rate of heat flow in the more stressed area (e.g. molten metal boundary) that is specifically within the range of 5-40% greater than in the "remainder" of the casting die or 10-20% greater than in the "other remaining areas" of the bath surface (in which an arbitrary point selected from a set of points within such indefinite "remainder" and "other remaining areas", respectively, would not have equivalent thermal properties), one of ordinary skill in the art would have recognized that various regions of the continuous casting mold of Makelainen et al. set forth a wide range of heat flow rate values, specifically in the thermally strained regions around the molten metal boundary (meniscus), and optimized and/or preferential cooling would be provided in order to reduce thermal strain that would lead to deformation (leading to bulges) in the mold (Makelainen et al.; page 1, lines 22-26 and 44-51).

15. Claims 1, 2, and 9 insofar as definite are rejected under 35 U.S.C. 103(a) as being unpatentable over JP 59-133940.

JP 59-133940 discloses a mold to cast a steel slab, in which copper plates at the short sides of the mold are capable of changing cooling water power (abstract; and Figures 1-8). The cooling power is changed in accordance with the change in thermal load (stress) in a vertical direction (abstract). Although JP 59-133940 does not teach a rate of heat flow in the more stressed area (e.g. thermal load in the vertical direction)

that is specifically within the range of 5-40% greater than in the "remainder" of the casting die or 10-20% greater than in the "other remaining areas" of the bath surface (in which an arbitrary point selected from a set of points within such indefinite "remainder" and "other remaining areas", respectively, would not have equivalent thermal properties), one of ordinary skill in the art would have recognized that various regions of the casting mold of JP 59-133940 set forth a wide range of heat flow rate values, including arbitrary values that would be selected along portions of the line(s) in the graph of Figure 6 of JP 59-133940. JP 59-133940 uses the adjustment of cooling water power in order to adjust thermal load and maintain a uniform temperature over the entire part of the short side copper plate (JP 59-133940; abstract).

16. Claims 6 and 7 insofar as definite are rejected under 35 U.S.C. 103(a) as being unpatentable over either Villanueva et al. (US 5,797,444), Stagge et al. (WO97/43063), Euler et al. (US 4,658,884), Mallener (US 3,595,302), Makelainen et al. (GB 2 177 331), or JP 59-133940, in view of Klein et al. (US 5,095,970).

Villanueva et al., Stagge et al., Euler et al., Mallener, Makelainen et al., and JP 59-133940 (individually) disclose/suggest all the elements of claim 1 above. None of those references specifically teaches the cooling zone extending at least 20% (or 30-60%) of the (indefinite) length (width?) of the meniscus of the broad-side wall.

However, Klein et al. teach a cooling device along the height of the wide side of the mold cavity that extends approximately 55-75% of the height of the wide sides of the

walls (column 1, lines 29-34; column 2, lines 67-68; column 3, lines 1-4; and Figures 1-4) for the purpose of uniform cooling of the metal strand product (column 1, lines 24-26).

It would have been obvious to one of ordinary skill in the art at the time the applicant's invention was made to modify the liquid-cooled casting mold assemblies of either Villanueva et al., Stagge et al., Euler et al., Mallener, Makelainen et al., or JP 59-133940, by adding the quantitatively specified cooling device of Klein et al., in order to obtain uniform cooling of the product (Klein et al.; column 1, lines 24-26).

17. Claims 12, 14, and 15 insofar as definite are rejected under 35 U.S.C. 103(a) as being unpatentable over either Villanueva et al. (US 5,797,444), Stagge et al. (WO97/43063), Euler et al. (US 4,658,884), Mallener (US 3,595,302), Makelainen et al. (GB 2 177 331), or JP 59-133940, in view of Nakashima et al. (US 5,207,266).

Villanueva et al., Stagge et al., Euler et al., Mallener, Makelainen et al., and JP 59-133940 (individually) disclose/suggest all the elements of claim 1 above. None of those references specifically teaches narrower configured coolant channels or cooling bore holes running parallel to the pouring direction with spacings of at least 20% less than in the horizontal adjoining areas of the bath surface in the transition area.

However, Nakashima et al. teach narrower configured coolant channels with regard to their spacings and widths (column 1, lines 47-61; column 4, lines 33-63; and Figures 2, 9, 11-13, and 16). These coolant channels are arranged in a parallel fashion in the thermally stressed area of the mold wall, as shown by the temperature gradients (Figures 11-13 and 16). The spacing of the coolant channels (as defined by the widths

w, 1.5w, and W) are at least 20% less than the horizontal adjoining area(s) of the surface in the transition (cooling) area(s) (Figures 2, 13 and 16). Additional coolant channels (bore holes) of varying widths and angles are situated between the surface coolant channels (Figure 9). The increased number of coolant channels is desired for the purpose of obtaining a more uniform cooling effect (column 1, lines 39-46).

It would have been obvious to one of ordinary skill in the art at the time the applicant's invention was made to modify the liquid-cooled casting mold assemblies of either Villanueva et al., Stagge et al., Euler et al., Mallener, Makelainen et al., or JP 59-133940, with cooling channels of various spacings and widths taught by Nakashima et al., in order to achieve a more uniform cooling effect (Nakashima et al.; column 1, lines 39-46).

Conclusion

18. This is a Continued Prosecution Application (CPA) of applicant's earlier Application No. 09/372,636. All claims are drawn to the same invention claimed in the earlier application and could have been finally rejected on the grounds and art of record in the next Office action if they had been entered in the earlier application. Accordingly, **THIS ACTION IS MADE FINAL** even though it is a first action in this case. See MPEP § 706.07(b). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within

TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no, however, event will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kevin P. Kerns whose telephone number is (703) 305-3472. The examiner can normally be reached on Monday-Friday from 8:00am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Dunn can be reached on (703) 308-3318. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 305-7718 for regular communications and (703) 305-6078 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

KPK
kpk
May 15, 2003

Tom Dunn
TOM DUNN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700